RESEARCH

Cariboo Forest Region

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EXTENSION NOTE #18
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Effects of Disturbance on Terrestrial Amphibians in Three Biogeoclimatic Zones

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Terrestrial amphibians are a relatively unstudied component of forest ecosystems in the Interior of British Columbia. Their populations had never been systematically examined and reported in the Cariboo Forest Region prior to this study.

STUDY OBJECTIVES

This preliminary study was conducted in the summer of 1993 to investigate the distribution and abundance of terrestrial amphibians. Both clearcuts and undisturbed forests were sampled in three biogeoclimatic (BGC) zones of the Cariboo Forest Region:

- Interior Douglas-fir (IDF),
- Sub-Boreal Spruce (SBS), and
- Interior Cedar-Hemlock (ICH).

BACKGROUND

The distribution and abundance of salamanders, frogs and toads are known to depend on forest attributes, such as coarse woody debris, canopy characteristics, proximity to water and related environmental factors, all of which vary naturally and are influenced by management activities.

Rotting logs provide protection from predators and a source of prey, while maintaining a microclimate with more constant temperature and humidity, which are generally good attributes for amphibian habitat. Burrowing amphibians inhabit the forest floor down to the mineral soil and are affected by soil characteristics, such as pH and depth of the forest floor. Timber harvesting and other management activities, such as broadcast burning, can affect these attributes.

Canopy cover affects evapotranspiration rates and thus ground moisture levels, and may also moderate ground temperature fluctuations. Changes to vegetation composition may also alter habitat suitability in many ways.

Density studies of amphibians in the Pacific Northwest have shown wide ranges, with high amphibian populations in patches of suitable habitat. Douglas-fir forests may have up to 180 salamanders per hectare.

Amphibians play an important role in forest ecosystems as predators of invertebrates and as prey for small

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mammals, birds and snakes. As a first step in biodiversity management, forest resource managers must know as much as possible about species ranges and frequencies. In addition, understanding of the effects of harvesting on populations will help allow a rational analysis of its impacts.

STUDY METHODS

The study used two methods of determining amphibian distribution and abundance. *Time-constrained searches* involved a systematic search for amphibians in a designated area for a fixed period of time. *Pitfall traps* involved grid arrangements of buckets with their rims buried down to the mineral soil surface and covered with forest floor debris.

RESULTS

The study identified four species of terrestrial amphibians:

- the **long-toed salamander** (*Ambystoma macrodactylum*),
- the **western toad** (*Bufo boreas*),
- the **wood frog** (*Rana sylvatica*), and
- the **Pacific treefrog** (*Hyla regilla*).

Table 1 lists each species' adult habitat and food source.

Table 2 summarizes the study results. Salamanders were most common in the SBS, while toads and wood frogs were most frequent in the IDF, indicating that terrestrial amphibian distribution varies by BGC zone. Salamanders were not found in the ICH and their numbers could not be correlated with coarse woody debris volume in either the IDF or SBS. There seems to be no preference by salamanders for either clearcuts or forests.

Western toads and wood frogs were more frequent in clearcuts than forests, which contradicts other studies in warmer areas.

Species	Adult Habitat	Food Source
Long-toed salamander	Underground, crevices and forest floor litter	Worms and arthropods
Western toad	Ground surface	Worms and arthropods
Wood frog	Ground surface	Worms and arthropods
Pacific treefrog	Arboreal and ground surface	Crawling and flying insects

Table 1. Summary of amphibian species, their adult habitat and food source.

The two survey methods showed differences in species counts, probably as a result of the effects of differences in species mobility. Time-constrained searches could be expected to undercount toads and frogs, two species that can easily move away from a search area. Pitfall traps would likely undercount salamanders, which are less mobile (except during breeding season) and thus have less chance of reaching a trap.

DISCUSSION

Further investigation is necessary to confirm trends in amphibian populations between forests and clearcuts. This was a preliminary survey, but undoubtedly, some species are more abundant in clearcuts than the undisturbed forest. There could be many reasons for this, such as fresh coarse woody debris and increased moisture. In addition, while a more open canopy may be detrimental to amphibian populations in more southerly climates, ground warming may be advantageous in the Cariboo. Further study is needed.

The study confirms there are significant populations of four species of terrestrial amphibians in the Cariboo Forest Region. It shows that although salamanders are rarely seen by the casual observer, they are abundant. The study also suggests that clearcuts do not intrinsically exclude amphibians, and has raised the possibility that under some circumstances clearcuts may even benefit some terrestrial amphibians.

CONTACT

For more information, contact **Bill Chapman**, Soil Scientist, at 398-4718.

REFERENCE

Ward, K. and W.K. Chapman. **The Relation of Disturbance and Biogeoclimatic Zone to Abundance and Distribution of Terrestrial Amphibians**. 1993. MOF, Williams Lake, BC. Unpub. doc.

Species	IDF	SBS	ICH
Long-toed salamander	More in CC (≥ 27/ha) than F (none found)	Highest population and more in F (≥ 85/ha) than CC (≥ 32/ha)	None found
Western toad	Highest population and more in CC (≥ 27/ha) than F (≥ 9/ha)	More in CC than F through pitfall traps (hundreds trapped). None found with time-constrained search.	More in CC (≥ 11/ha) than F (none found)
Wood frog	More in CC (≥ 68/ha) than F (≥ 9/ha)	More in CC (≥ 11/ha) than F (none found)	None found
Pacific treefrog	Sporadic and low frequency with pitfall traps; none found by time-constrained search.		

Table 2. Summary of Amphibian Frequencies in Forest (F) and Clearcut (CC) by Biogeoclimatic Zone